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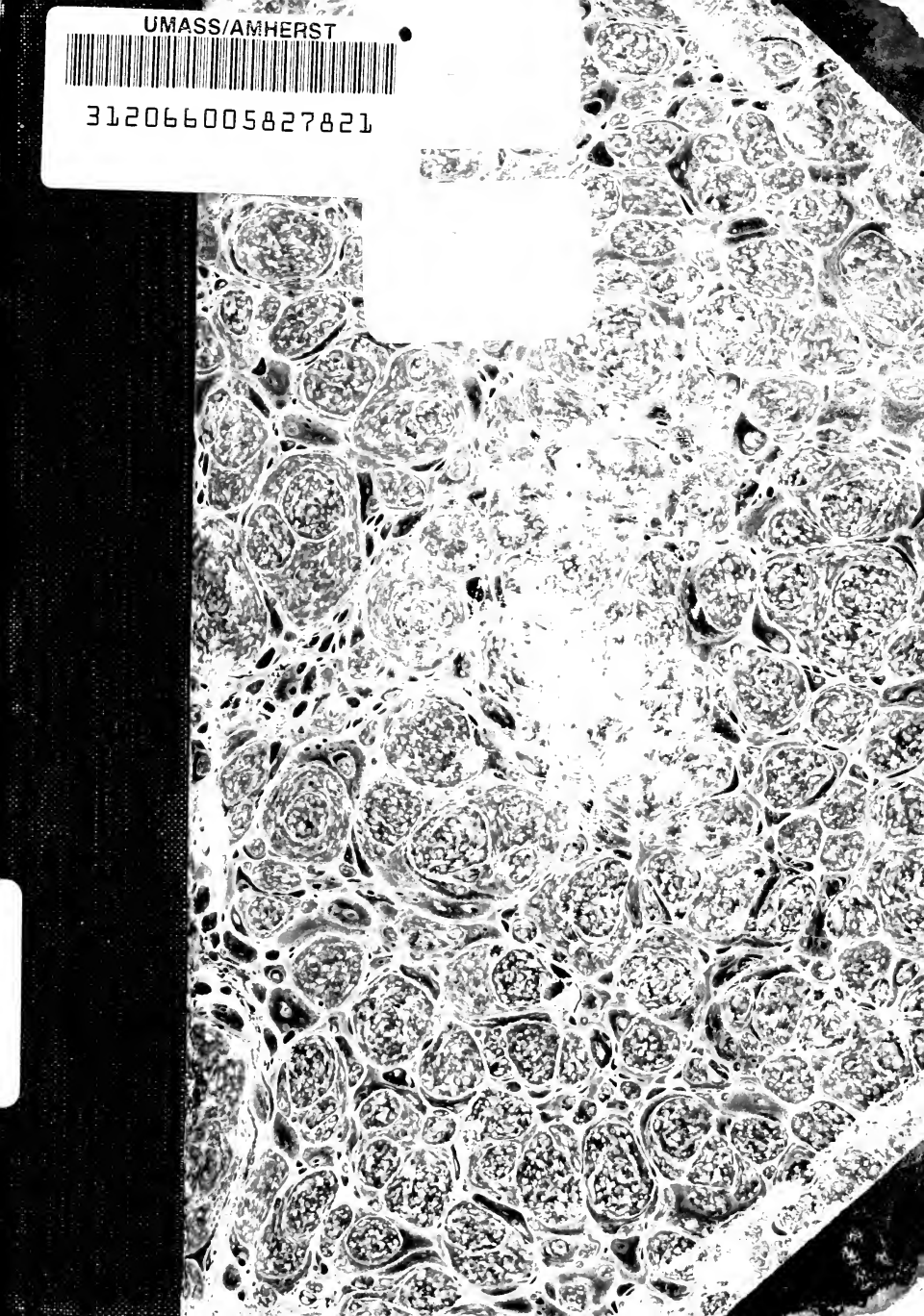

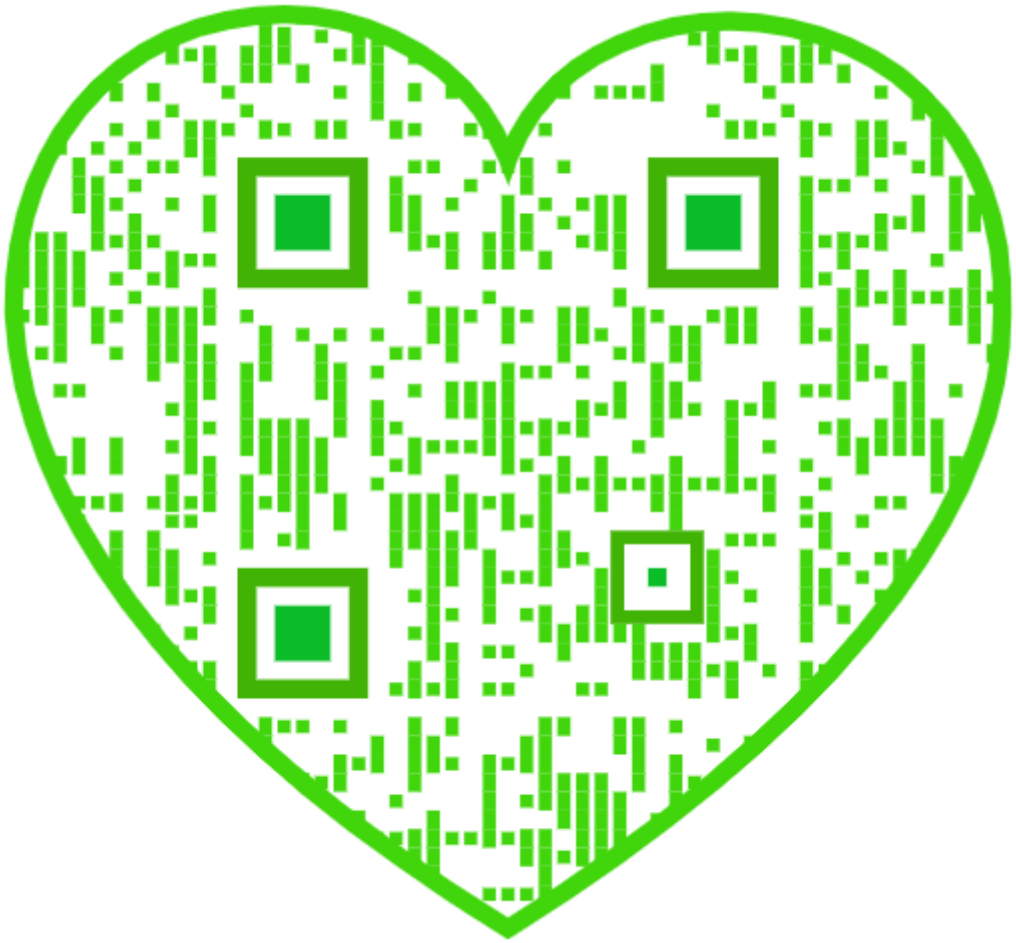

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HAND-BOOK

—ON—

CHEESE MAKING,

—BY—

GEO. E. NEWELL.

PUBLISHED BY

THE MICHIGAN DAIRYMAN,

GRAND RAPIDS.

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PREFACE.

This little work on cheese manufacture is inscribed to makers, dealers and consumers, in the hope that its careful perusal may be of aid to one and all. The prestige that American cheese holds in the markets of the world has been threatened from many quarters, but we who inaugurated the Cheddar system on this side of the Atlantic are not prepared to succumb to competition, however sharp, or to prejudice, however strong. American cheese will hold its own as long as it has a square quality basis to stand upon. We possess the most natural and privileged dairy regions on earth. Let us utilize to their fullest extent the great advantages within our grasp. Dairymen have of late been struck with consternation by the ascendency of Canadian cheese over the States' product. The dairy press have been pounding away at the gruesome situation so vigorously that many cheese men have been frightened into the belief that Canada has a corner on gilt-edged quality and fancy quotations that is liable to continue indefinitely. The writer has no such apprehension, however, and sees no reason why an American cheese should not always be a peer of the best. There has been unanimous action all over the dairy portions of the Dominion to effect the slight advantage they now hold. If, in a strenuous endeavor

to improve the product, our friends across the border have succeeded and at the same time have stimulated us to a like movement, then thanks be to them. Legitimate competition aids all mankind.

As the caption indicates, this treatise is from the pen of a practical maker, who analyzes cheese manufacture from a standpoint of practice and experience, and not theory. In elucidating to my readers the fundamental and collateral fabric of milk manufacture, I write from the desk of a cheese factory, with milk, utensils and product under my immediate and daily supervision. In these pages, I shall discard everything theoretic, and base the whole value of the book on its practicability. In doing so my constant thought shall be the elevation and supremacy of American cheese to the highest standard attainable. To this manual I especially invite the criticism of the cheese profession in general, trusting that it may be a convenient book of reliable reference to the experienced and a work of utility to the novice.

GEO. E. NEWELL.

LEONARDSVILLE, N. Y.

THE FACTORY BUILDING AND SITE.

The site for a cheese factory should be a well-drained, slightly elevated location, convenient to a copious and perpetual flow of water. The size of the building is, of course, to be measured by the amount of milk to be manufactured therein, but the same internal arrangement is needed alike in both small and large factories. The building should rest on a substantial stone foundation, with a free circulation of air underneath, and a complete system of troughs be appendent to carry all slops and whey beyond contaminating distance. It is unnecessary that the building be more than a story and a half high, unless the upper apartment is required for something besides curing cheese. The make-room should be ceiled, and the curing-room plastered. The make-room should be in the front of the building, with the engine-room on one side of it and the milk delivery window on the other. The curing-room should be in the back. Cut off all superfluous space about the building and have just enough room to be nicely convenient. Put an awning roof over the delivery window, wide and long enough to cover wagon and team. Set the vats broadside to the milk scales, with ends towards the outer door. The platform for the weighing-can and scales should be on a level with the top of the vats. A small office desk should be hung to the wall near the weigh can, and close at hand, so that every patron can see them, should be arranged the cream tubes, and lactometer. Tin utensils

can be hung on pegs in the wall, and a stout, low shelf in one corner will support rennnet and annottoine jars. Have the aisle between the vats wide enough to permit of easy passage, and at the farther ends of the vats sink a trough into the floor to carry off the whey. Have similar troughs under the presses. The floor should be full enough in the center to gravitate all slop toward the drains. It is useless to have a factory floor wet all of the time; keep it dry by a system of neatness. The curing-room should have an outside door, from which cheese can be loaded. An adjoining lean-to shed, for storing empty cheese boxes and housing fuel, is also a needed addition to the building. For a one day milk delivery factory, no ice-house is required. Build substantially and paint neatly, aiming to have a model-looking factory.

Beginning of the Cheese Factory System in America.

About the year 1853, a gentleman residing near Rome, Oneida county, N. Y., Jesse Williams by name, conceived the idea of manufacturing his neighbors' milk in common with his own. This is the first known instance of manufacture in this country by associated dairies, although the method was previously in vogue in Switzerland. I quote from an old report: "It required a long time to create the demand which now exists in England for American cheese, and to Herkimer county, New York, belongs the credit of creating it and securing the trade. It was mainly effected by bringing a high degree of skill to bear upon the manufacture generally, thus producing not only a good article, but uniformly good, or as near uniform as is possible when made in different families. Cheese had been sent abroad in small amounts for many years, but when once by good quality and uniformity it had secured

a firm foothold, the amount exported increased with astonishing rapidity. By gradual growth it had come to nine million pounds in 1859, in 1860 it amounted to twenty-three millions, in 1861 to forty millions, and the demand and supply have steadily increased ever since. It is a noteworthy fact that systematic attempts to improve the manufacture of cheese began to be made both in Somersetshire, England, and in Herkimer county, New York, about the same time; and also, that with no knowledge on the part of either of the progress made by the other, after lengthened experiments, both should have adopted substantially the same method; for it is a fact that the Cheddar and Herkimer methods so closely resemble each other that the only differences of any consequence are such as necessarily grow out of the difference of climate. Their process differs from most methods mainly in two particulars; first, in employing milk which has attained a proximate degree of acidity, although never enough to be sensible to the taste, instead of such as is quite new; and, second, in the separation of the whey from the curd by causing its contraction and precipitation, instead of depending mainly on mechanical means. The improvements thus introduced within a comparatively recent period have resulted in several important advantages: First, a material reduction of labor; second, the production of a larger amount and a better quality of cheese from a given quantity of milk; and, lastly, the cheese made by this method requires less time for the ripening process, and thus is sooner ready for the market.

Utensils Necessary to Stock a Factory.

A BOILER of moderate capacity, with fittings complete; milk vats with steam pipes and connections; patent galvanized iron cheese hoops; a gang press; weigh can with large gate; milk conductor to convey the lacteal fluid from the

weigh can to the cloth strainer over the vat; common sized scales that will weigh at least 600 pounds; small sized scales for weighing cheese; two curd knives, one with horizontal and the other with perpendicular blades; large wheel with crank and endless rope for hoisting milk; two stone rennet jars of a capacity of ten gallons each; two thermometers, one for the make and the other for the curing-room; jar for keeping annottoine; syphon and tin strainer for drawing whey from the vat; a self-salting curd mill—a curd mill is now indispensable to a factory, and a self-salting one is indispensable where only one man is employed; rubber mop, curd broom and floor broom; milk book for keeping accurate account of all business transacted in the establishment, including daily receipts of milk from patrons; a set of glass tubes in a case, for testing milk as to the amount of cream it contains and comparing its state of maturity; two water pails and one curd pail; a heavy curd scoop; two dippers, one of three and the other of six quarts capacity; glass graduated jar and lactemeter for testing milk to locate water—be sure and purchase a lactometer gauged for trying milk at 80° Fahrenheit, many being gauged for 60° Fahrenheit, and of little use in hot weather unless you have ice handy to chill the milk designed for the test; stencils, case and brush for dating cheese and branding boxes; tin funnel for conveying whey from the vat to the outside tank; curd rake for agitating the product when cooking; a cheese tryer; a curd sink is not now strictly essential, although some makers still prefer to use one.

In glancing over the above list we will mention some of the articles that can be supplemented by utensils of a more primitive and cheaper make. Such a retrograde change is not, however, desirable, although sometimes in a small factory where the receipts to the manufacturer are limited, strict economy has to be practiced in order to leave a margin of profit. With economists of necessity the boiler can be dis-

carded and an old-fashioned under-heater vat, with a hot water tank attached, made to do service. I know of dozens of small factories throughout Central New York who get along admirably with such apparatus. In the matter of press and hoops you can do better without the gang press than you can without the patent hoops. Remember that it is no economy to go back to the primitive hoop that makes necessary the hand bandaging of every cheese. If obliged to go without the gang press, get hoops that can be bandaged before the curd is put in them, so that two cheese can be pressed under one screw in an old-fashioned press. In such a case wooden followers would be required. One pair of scales can be got along with at a pinch, although two pairs would save a great deal of transferring and extra work. Do not get along with one curd knife—you need both the horizontal and the perpendicular, in order to cut the raw curd evenly and economically. A crane can take the place of a large wheel for hoisting milk if you consider it more convenient. Keep rennet in nothing but stone jars or vessels and keep at least ten gallons always prepared ahead. Jugs are often used for annottoine, although an open jar admits of easy dipping and accurate measurement. Have your tinner make you a long, narrow gill cup, to which should be soldered an upright six-inch handle with a shepherd's crook in the end. Use the cup for measuring out the coloring; the long handle, which can be hung by the crook on the inside of the jar, precludes soiling the hands, clothing and floor with the scarlet dye. A curd mill of some sort is positively necessary in order to facilitate good, even stock; do not leave one out of the list of apparati under any consideration. I prefer a self-salting mill, not only on account of the ease with which curd can be ground but also for its superior mechanism in thoroughly mixing the salt into the curd as fast as it is torn by the teeth. In grinding curd with a common machine, the torn shreds quickly re-amalga-

mate into an almost solid mass that often requires harsh manipulation to separate. Then, again, the salt being sprinkled by hand over the outer surface of the freshly-torn curd sears and burns it before it can be worked into the mass. With a self-salter, the saline condiment is equally distributed through all parts at the proper limit of acid formation, thus preventing the curd from packing solidly and making the quality even and fine.

MANUFACTURE OF CHEESE.

COAGULATION OF MILK.

If the milk you have in your vat is mature, or, in other words, slightly tending toward sour, heat it as rapidly as possible when preparing for the application of rennet. In the cool extremes of the season heat milk to 86° Fahrenheit and in warm weather to 85° before rennet is applied. If the milk is all right as to sweetness, as the bulk of milk is, heat it up to the desired point gradually, stirring it gently at frequent intervals with a long-handled dipper. You stir for the purpose of keeping down the cream and evenly distributing the warmth that is permeating the lacteal mass. You stir it with great gentleness and care because milk globules are eggs in miniature, and, like their large relatives of biped production, they must be handled with care. If you wish to heat to 85° and have an under-heater vat or fire flue beneath the milk, withdraw the fire before it has quite reached that point, as the after warmth will carry it up a degree or two. Be perfectly precise in all such little points, for on them hinge big results.

With milk in normal condition as to maturity, standing at a temperature of 85° in both ends of the vat, and with no cream visible on the surface, you are ready to take another

step in the course of manufacture. If colored cheese are desired, now apply annottoine sufficient to give a rich, golden hue. Know exactly by experiment its strength as a dye, always know the quantity of milk to a pound and portion out accordingly. Work the coloring into the fluid with the same gentleness with which you have heretofore manipulated it while raising the temperature. When the milk is all of one even, yellow tinge, attesting that the annotto is represented equally in every part, it is ready for the real inceptor of cheese, rennet. The tendency of modern cheese making is toward quick coagulation of milk. The larger infusion of rennet necessary for this purpose begets cheese that can be quickly cured for a market where they are expected to be soon consumed. The old rule of coagulation in twenty minutes is now nearly obsolete, although it will always hold good for cheese of long keeping qualities. Fall made cheese that are expected to be consumed during the winter months should be strengthened for age by coagulation in from fifteen to eighteen minutes. When we are dealing with the average spring and summer make, trade demands more perishable stock and we must cater to it. If you do not know the strength of your rennet and you want the milk to thicken in eight or nine minutes, as it should do, previously test the lactic juice by putting a teaspoonful into a tumbler of milk kept warm at 85°. If the glass of fluid thickens in five minutes, you need one quart of such rennet juice for every 800 pounds of milk to effect coagulation, as stated above. If the tested quantity thickens in less or longer time, a proportionate less or greater amount is required for your purpose. Measure the rennet extract with exactness, so that there will be no miss in its proper adjustment to the milk, and then incorporate it into the vat of lacteal fluid. In infusing it into the milk structure, manipulate your dipper with the same caution that has characterized your former attitude toward the

fragilely constructed fluid under your hand. After stirring for five minutes, withdraw the dipper and let the surface of the milk come to a calm. Then pass the bottom of the empty dipper lightly over the vat to drive back any particles of cream that may be struggling to the surface. The milk will soon begin to roll up in the wake of the tin utensil in your hand in a rapidly thickening wave. Immediately withdraw the dipper, for the rennet has accomplished its mission. Turning to your vat cover, stretch it tightly over the fermenting milk. The cover mentioned should consist of a strip of canvas cloth or sheeting running the entire length of the vat and lapping slightly over its width. The cloth should be tacked to lath or other light wooden strips the width of the vat, and these supports should be about two feet apart. When not in use, the cover can be rolled up like a section of carpeting and is not at all awkward to handle. Place the cover in a closed form on one end of the vat, and, unrolling it as fast as you walk, you can stretch it to the other end in half a minute, thus keeping your milk snug and close. I prefer to use such a cover every day during the season, and they are indispensable in spring and fall. Without some such device the crust of the rapidly forming curd is chilled, retarding the action of the rennet, and the temperature of the whole mass is preceptibly lowered, which is not only undesirable but positively detrimental to the natural and perfect formation of cheese.

In the course of twenty or thirty minutes after coagulation examine your crude cheese material and see if it is ready to cut up. Thrust the forefinger into the mass, and if the curd will split cleanly in front of it, it is ready for the knives. Milk should stand about forty-five minutes after the infusion of rennet before it is cut, but if the milk is very mature in quality rennet will act on the casine more spontaneously. It may be firm enough to cut before that time ; if, in such a case, the same amount of rennet had previously acted slowly on a

proportionate quantity of milk, you can at once consider the quick action as a fair warning from nature that you must scald your curd in haste to keep ahead of the swiftly multiplying acid germs. As previously stated, as soon as the curd mass will cleave brittlely over the finger prepare your knives. First pick up the one with horizontal blade and hold it a second in hot water. This will warm the steel so that it will not chill the curd. Cut the mass lengthwise, turning corners deftly without lifting the instrument once until you are through. Then lay this knife aside for its work is done. Insert the perpendicular knife also in hot water and with it cut the curd first crosswise, then lengthwise, then crosswise again, being sure to lap over the course of each cut. The curd is now in small cubes that are fast discharging whey from their severed cellular system. They gravitate toward the bottom of the vat. If the curd has been cleft by the blades, gently and with great care, the rising whey has a clear, greenish cast, attesting that it is freed from most of the albuminous substances of the milk and will render a good ratio to the patrons.

SCALDING.

If the milk was mature, or too much rennet was incorporated with perfectly sweet milk, the whey will separate from the solids very rapidly. In either case it wants an immediate application of heat after cutting. Curd from fairly good milk, with a proper infusion of rennet, should stand for a few moments after cutting before heat is turned on. Never apply heat under any circumstances until the raw curd has all disappeared beneath the whey's surface. As soon as the heat has warmed the bottom of the vat, bare your arms and with the hands gently lift the new cut mass to the surface. In this lifting give it a rolling motion, so that the cubes will all fall apart and exchange positions with one another.

Two dangers now arise and you must be prepared to steer straight between them. First, as the heat comes surging up from beneath against the tin bottom of the vat it makes it very hot below and cool on top. If the raw curd settles but a moment against the hot bottom it is liable to be blistered and seared over, to the subsequent detriment of the whole mass. Of course, it needs a slow application of heat on the start and almost constant agitation, and here comes danger number two. If you do not stir your curd sufficiently in heating, the quality of your goods is at stake, and if you do not stir judiciously, or stir too often and too harshly, your milk ratio is in jeopardy. By exercising good judgment, care and caution you can avoid the two extremes and make each danger your willing servant. If your milk on the start is sweet and pure, allow the heat to go up slowly until it touches the desired point. If, on the other hand, it is ripe, old or sour, push the heat with all vigor and scald as quickly as possible. With milk all right, about three-fourths of an hour's time should be consumed in bringing up the heat to the scalding limit, but if otherwise get it there in fifteen minutes or half an hour, according to the exigency of the case.

But, to return to the subject of scalding a vat of curd in normal condition. On the start using your hands as described, manipulate it with such care that the tender cubes are not bruised and yet are kept separate enough so that they will not form into a compact mass on the warm bottom. All this time the whey is percolating from the blocks and they are shrinking in size and becoming of tougher texture. As soon as the curd begins to assume a slightly elastic consistency begin operations with a rake. If you have an idea that curd wants to be stirred all of the time through the scalding period, at once disabuse your mind of it. Such a notion is antediluvian in its conception and disastrous in its results, but, strange to say, it is the predominating feature of the

know-it-all young maker's knowledge. Novices at the business are sure to stir too often and too violently. This knocks off the yield and also injures the quality of the cheese. For myself, above all patent devices in the shape of wire rakes for agitating curd, I prefer a simple wooden hand hay rake. Get one made of wood throughout and saw off the handle, leaving the stub about four feet long; this will insure convenient handling. When the moment arrives in the early cooking departure to use the rake, take the utensil described and, inserting it teeth up in the whey and curd midway of the vat at one end, push it gently from you to within two inches of the farther edge, letting the back of the rake head slide on the bottom of the vat. Be sure and do not let the teeth and head of the agitator hit the side of the vat, as curd is pushed before it which does not want the substance and nutriment crushed out of it that way. As the rake approaches the side of the vat give it an easy, undulating, upward swing, ending by a draw of the rake toward you. This will cause the curd that you have been pushing from you along the bottom of the vat to boil up with the whey in the wake of the retreating rake. If the motion has been gone through with easily and carefully, you will at once see that the curd within the rake's sweep has been thoroughly agitated without bruising. After the manoeuvre described, do not change position but drawing the rake toward you, with its head scraping the bottom of the vat, produce a gentle ebullition of curd and whey in the same way as that just manifested. Step along, repeating the pushing and drawing of the rake until the farther end of the vat is reached. Then, push the curd with the rake up on one side and down on the other of the vat, changing ends, as it were, with the cooking cheese. Once over a vat in this way, if accomplished properly, thoroughly separates the curd particles and evens up the heat through the whole mass. Now, let the rake rest but have the heat

go on for a few moments. When the curd begins to pack slightly (perpaps in five minutes, more or less, according to the previous maturity of the milk), again stir it up in the manner described and again let it rest, repeating the periods of agitation until it is scalded up to the desired temperature. In regard to the right temperature at which to scald cheese we cannot hope to give on paper much more than superficial information. Every phase of cheese making, to be thoroughly understood, requires practical experience, but hints and pointers on paper are often just what are needed to help puzzled ones out of awkward dilemmas encountered in the business. Hence, we shall, in the most clear and logical manner possible, give the reader our views, derived from experience, on scalding temperature.

RIGHT TEMPERATURE.

In the spring of the year, hay produced milk is comparatively poor and thin. When it reaches the manufacturer's hands it is generally as sweet as a rose in regard to acid, although not always so in regard to stable tang. When it has been transformed into curd it must be scalded high enough to cook it, whether that takes a temperature of 98°, 100° or 110° Fahrenheit. Don't think, as some do, that the curd is cooked when it has reached the temperature you are using—generally it is not more than half cooked then. We will say you began making cheese on the first day of April. You are not an expert at the business and, being anxious to make a good beginning, feel a trifle nervous over the situation. Keep cool and bring the temperature of the curd up to 100°. On reaching this heat immediately cover up the vat with the carpet-like canopy previously described. Be sure and give it a thorough rake stirring the last thing on reaching the scalding point. If the make-room is reasonably warm the canvas roof will keep the whey at a mercurial heat of 100° for a long while. After a few minutes examine the curd and see how

it is progressing. Stir it up occasionally—once in fifteen minutes or so is sufficient—and after it has stood an hour and a half at 100°, if it does not squeak sharply between the teeth when chewed or immediately fall apart when squeezed dry of whey in a double-handful, you may be assured that 100° was too low a temperature at which to cook it. The object is to cook at the lowest temperature which will do the business within a reasonable time. The higher the temperature used, the quicker it will be cooked, but it will require more milk to make a pound of cheese. A good yield and a good quality must both be gotten out of the milk—these are fine points in cheese making. The curd we have spoken of has stood in the whey at 100° degrees for one hour and a half and is yet insufficiently cooked. An hour longer at the same temperature would probably cook it to the right degree, but there are objections to letting curd stand in the whey so long—it gets whey soaked and begins to disintegrate slightly, even when no acid is perceptible. So, after a ninety minute test, (or, better yet, before), raise the temperature two, four, six or ten degrees, as your judgment warrants, and bring it to a firm consistency as quickly as possible.

We are now supposed to be working spring or fall milk that is obstinately sweet and very hard to cook. In summer or warm weather, milk is, of course, mature; this aids and hastens the cooking process while sweetness retards it. In cool weather and with good milk, having found that a minimum of 100° will not cook the curd after standing at that temperature an hour and a half, fix your standard higher and bring it within the rule prescribed. Be sure that your curd is thoroughly cooked. Thousands of boxes of weak, half raw cheese are thrown on the market every spring that are deficient in quality through a lack of heat in the vat. The most convenient and sure test of which I are aware, to tell that the curd is "done," so to speak, is to grasp a large double-

handful and compress it dry of whey; if it quickly, after pressure is withdrawn, falls easily apart on the palm of the outstretched hand, you may be sure that your curd is thoroughly cooked in every way.

Now we come to acid.

ACID.

Acid microbes are inherent in the lacteal structure and come dormant in the milk from the udder. As soon as they feel the atmosphere they spring into spontaneous activity, however retarded by cold or fostered by heat. Acid in milk is a species of yeast fermentation and is the first step toward decomposition. It is the best servant the cheese maker has and is also his worst enemy when the relation is changed to that of master. In a temperate climate, in hay produced milk, in the spring of the year, acid is nearly dormant and there is but little use for it. Hay cheese are expected to be thrown on the market in cool weather when they will be quickly consumed; therefore, the additional firmness given by acid is not required to be applied as a safeguard against heat. If early hay cheese are cooked enough and salted about two pounds to the thousand, it is all that is desirable. On the border between hay and grass the weather is gradually moderating and there is torrid temperature in sight in the immediate future. Acid now begins to appear in the whey and curd you are working by the time you have it scalded. It has a right to be there for it is your friend and you now need its timely proffered assistance. If, through unusually good quality of milk, it does not come to the front, coax it a little in the following way: After the curd is cooked and before whey is drawn, turn on steam and re-warm the whole mass, then draw the whey and pack the curd in bulk as much as possible, covering it up with a cloth. This will soon set the acid to working in good shape. Always rely on the hot iron test to locate acid. It takes an expert to get the amount of

acid even from mess to mess by an olfactory measurement. On March and the first half of April stock I do not care for any acid to show, but on later April and beginning of May goods acid should show on the hot iron clearly and perceptibly. When the curd is pressed to the metal, fine strings should just start from it immediately prior to salting. At this time you want just a little acid but not too much—too much will surely spoil spring made cheese.

The question arises, "How far must a cheese maker probe into the hidden mysteries that shroud the digestive assimilation of the product he manufactures?" We answer that he cannot probe too deeply or extend his researches too far into the minute. There are too many makers now with only a superficial knowledge of their craft, and before there can be any perceptible elevation of quality in American cheese the shoes of these novices must be filled by such men as we now term "experts." Take, for example, the subject of acid which we are here discussing. A maker who can preceive it only as it is revealed by stringing on the iron is not competent to be in charge of a factory, for anybody could detect it there. The development of lactic acid is a species of fermentation induced by the spontaneous increase of inherent minute bacteria. It takes the same experience to perceive and govern it in milk and cheese as it does practice with square and compass to become a carpenter. We cannot *tell* you all about it—it will take many days of careful observation and fine testing to understand its nature enough to make it your servant in the cheese making art. That is why makers without practical experience are always incompetent. Hold curd in the whey until it shows at least a quarter of an inch of acid by the hot iron and then draw off whey as quickly as possible. It is always a good plan where you have large vats and they are pretty well filled to have a third of the whey drawn off before acid develops, for then you can more quickly lay bare your

curd. As the whey recedes, push the curd with the rake head toward the upper end of the vat and then tip the vat down, so that the whey will flow out from the lowest corner. Make a gutter with your hands through the center of the curd mass and distribute it in an even pack on each side of the vat. Now, take a knife and cut it into strips eight inches wide, drawing the knife from the center gutter toward the side of the vat. Flop these strips upside down and, to farther facilitate drainage, cut a longitudinal canal next to the sides of the vat. Examine by the iron and see how the curd is working as to acid; if it is maturing slowly and the curd is not hot, shut off all draughts of air, cut the curd into "bricks" or blocks the size of a brick, and scatter them over the bottom of the vat. Then cover the vat up with the same cloth that you used when scalding. If, on the other hand, the curd is hot and maturing rapidly, cut into small bricks, scatter well and give it all the air possible, frequently turning the bricks over. Unless positively unavoidable on account of overplus of acid never grind curd until you have cooled it down to a temperature of 80°. Above that heat the fine texture of the curd is torn and mutilated so that it will give out white whey, and, as a consequence, waste of quality and substance ensues.

The curd being first well drained and cooled to 80° by subdivision of pieces and having also developed acid sufficient for the season, it is ready for the mill. Grind with deliberation, and if you have a self-salter, so much the better. Incorporate the salt into the curd by thorough, although not violent, mixing and then air your curd. This is one of the most important processes of all and yet the one most neglected by negligent makers. A curd requires airing, not so much to expel heat as to expugn the gaseous odors that have followed it down from its animal origin. Stir it well at frequent intervals and spread it out well over the surface of the vat. So calculate that it can lay twenty minutes or half an

hour before it has sunk to the temperature of 70°, when it is just right for the hoops. Allowing it to lay this length of time gives the salt an opportunity to strike into the pores and impregnate the product with its saline properties before being put under pressure.

HOOPING CURD.

On placing curd in the hoop measure it all in a pail and then you will get the cheese of nearly an exact weight. When spreading on the cap cloth wring it out of warm water, tht last thing stirring up the surface curd from below, so that there will be warmth to form a good rind. Apply the pressure slowly at first, and as soon as the whey starts from the hoops with a "gush," desist and let them rest for a few moments. The reason for this is to retain the salt and not expel it with the whey by an injudicious display of strength. You have, perhaps, considered two pounds or two and a half of salt per 1,000 pounds of milk just right for the curd and the season of the year, and it would be most unwise and foolish to let it dribble away to the detriment of the product. As soon as the whey ceases to start freely come down snugly on them with the lever and then turn your attention to washing up the vat and utensils.

CLEANING TIN UTENSILS.

This part of a maker's duties has an important bearing on cheese manufacture, for if he is a sloven it does but little good for patrons to strive to furnish him with pure, sweet milk. Wash the vat and utensils through two waters and scald with that which is boiling. The vat and all utensils should be scoured at least once a week with salt, to prevent the propagation of a yellow and white fungus growth that is a persistent parasite of factories. Milk strainers should be hung out where the bright sunshine can reach them, and all the

windows and outside doors to the make-room should be opened, to drive out the dampness that has accumulated during the forepart of the day.

PULLING UP THE BANDAGE CLOTH.

In from fifteen to twenty minutes after hooping curd turn your attention to them again. If the old style hoops are used you will be obliged to bandage them by hand; if not, to pull up the bandage cloth. As the former way is nearly obsolete, we will simply discuss the *modus operandi* of the latter.

Set a pailful of clean warm water near you, and as you remove the cap cloths rinse them vigorously in this, to wash out all sour whey. Pull the margin of the bandage up and turn it neatly over the edge of the cheese; then, wringing the cap slightly, to remove only the surplus water, spread it over the surface, smoothing out all wrinkles. Apply, now, all the power that you have, that is, reasonable power. You do not want to press so hard that the butter will be crushed out of the cheese structure, but you want to press so as to expel all whey and permanently solidify the cheese. I examined 1888 made cheese this spring that were of fine quality but insufficiently pressed. The seams and cracks were mouldy and damp with whey, which damaged an otherwise fancy product 50 per cent.

CLEANING UP.

Cleaning up is the last duty of the cheese maker for the day. I use hot water freely on any portion of the floor with which whey has come in contact, and especially should it be used about the spouts and drains, for it is here that filth lurks and easily conceals itself. Boiling water will search it out and eradicate it; dash it on copiously all around. Sal-soda and potash are helpful aids to keep the make-room sweet, and a liberal supply should be counted among the necessities of of every factory.

THE CURING ROOM.

It is just as easy to have a model curing room as one that is defective in structure. A cheese may be turned out of the hoop the acme of perfection in every detail of manufacture, and yet subsequently be damaged partly or wholly ruined by inhabiting a faulty curing apartment. The curing room should not be in a loft, or above the make-room. It should be on the ground floor, and for convenience it should open direct from the make-room, the door being easy of access to the press. The partition between the two rooms must be impervious to the steam arising from the cheese vats, as the animal vapor is detrimental to the maturing product on the shelves. The room should by all means be plastered, and have windows that can be lowered from the top when necessary for proper ventilation. In these times when cheese are frequently shipped when only ten days from the hoop, a large curing room is not necessary even for a large factory. The smaller you can have it without crowding, the better. If you want a room that will hold 300 cheese, lay shelves 2½ feet above the floor that will accommodate 100, put in stout uprights 7½ feet high, and on cross pieces above lay two more tiers of shelves of the same surface capacity as the bottom counter. When it is finished you have three tiers of shelves encircling the room, save for two doors, with space left in the center for a box stove. The object of arranging shelves one above another is not so much to utilize space as it is to scientifically cure the product. It, however, answers for both purposes. In a room, temperature rises with height, and the atmosphere is, of course, several degrees warmer near the ceiling than in the region of the floor. Hang a reliable thermometer on a range with the second tier of shelves, in a portion of the room where it will not be affected by direct heat from the

stove. In this position the mercury should range from 65° to 70° Fahrenheit, the temperature on the top shelf at the same time rising to the vicinity of 75° Fahrenheit. We will be supposed to carry a day's make of cheese into such a room when it is empty. Place them all on the top shelf in regular order, two deep. Continue to add from day to day until the top shelf is completely filled all around. Then begin at the end where you first started, and take down the first day's make and place on the second shelf, arranging those fresh from the hoop in their place. Continue this process all around until the second tier is filled. Your next move will necessitate two removals, leaving the oldest on the bottom tier and the greenest on top. As soon as a cheese leaves the hoop a certain warmth of atmosphere is necessary to assist the process of fermentation that should at once begin. If this warmth is lacking green cheese will sour on the shelves before they can cure. Therefore, always place them in the most favorable position for assistance in the direction of maturity that you have at command.

CARE OF CHEESE.

Take cheese from the hoops after they have been under pressure about eighteen hours. If they have been properly made and thoroughly cooked, and the cap cloths are sweet and clean, the latter will peel from the ends without making an abrasion of the rind. Allow them to stand an hour or so on the shelves before greasing; the surface moisture will then have evaporated, and the rinds will deepen to a golden color and become crisp and slightly rough under the touch. Heat whey butter as hot as you can bear your hand in it, and, using a large piece of bandage cloth (no other cloth is as good), dip it in the hot grease and apply by a thorough rubbing-in to the cheese surface. The butter being hot will strike in and lend

toughness and elasticity to the rind. Date the cheese after they have been on the shelves a day. The bandage cloth will then have become dry, and the dates can be made to show clear and distinct. Turn cheese over every day and rub them thoroughly with a sponge of bandage cloth, well oiled. Dealers, retailers and consumers insist on a good, perfect rind, and, as makers, we must give it to them. Appearance sometimes goes farther than quality, but we want both, and want them united. Sometimes cheese will mould on the sides during damp, muggy weather in summer. It will not do to drive out the dampness with fire, so establish a free circulation of air through the room and the mould will cease to accumulate. In a curing room it is easier to keep temperature where you want it during cool than in hot weather. If the mercury gets to running up above 75° Fahrenheit, sprinkle the floor vigorously with cold water, take out the window sashes, and on the south side keep the blinds closed, or a shade down. Good cheese can endure a temperature of 80° for a while without deteriorating, but such a heat is not desirable; keep it below that if possible during a hot wave. The shelves on which the cheese rest should be of sound lumber, smoothly planed basswood or pine, and each board a little wider than the diameter of the cheese. Care should be taken to have the bandages the exact circumference of the inside of the hoop. If the band is contracted, the cloth will split open under pressure and expose the cheese to the attack of skipper flies; if too large, the cheese will expand on the shelf and make it difficult to be jammed into a box for shipment. The reason the curing room should not be over the make apartment, or in a loft, is that in the former the vapor and odors generated below are not desirable curing factors, and in both cases excessive heat is unavoidable, due to the elevation and the direct rays of the sun on the roof. When cheese get so warmed up that the butter starts, the flavor is deteriorating also. While curing, cheese need ventilation,

draughts of air should be avoided, as thereby the surfaces are dried up and checked. Too much light is not desirable in a curing room; shades should be used at the windows to regulate this. It is now customary to ship cheese as soon as they cease to be curdy, which occurs in from ten to fifteen days from the hoop.

EXPERIENCED HELP.

One great set-back to good cheese making is inexperienced and careless labor. This is another cog in the wheel that has been retrograding the reputation of our goods during the last few years. A medical student cannot obtain a diploma authorizing him to take under his charge the welfare of the sick without three years' study aided by ocular demonstrations of his especial science. Then, he is expected not to have a dim idea of a patient's condition when diagnosing his case, but to know and understand all about it. No cheese maker is fit for duty unless he can diagnose the condition of a vat of milk on a quick examination. The natural odor of pure milk has a peculiar animal smell, whose nature can be acquired by careful olfactory tests indulged in as the student draws the fluid from the cow's teats. After an apprentice at the business can tell pure, sweet, untainted milk in any spot or place, he must learn to distinguish between that which is tainted and that which is verging on the sour. Tainted milk is radically different from sour milk, and infused in the product they each tend toward utterly diverse results. To pass a correct judgment on milk quality is thus essential No. 1 in a maker's practical knowledge. Requirement No. 2, is to have a thorough understanding of the constituents and influence of all of the foreign ingredients that go into cheese. Rennet, the most potent auxiliary of the cheese maker's craft, should never be handled or applied by ignorant hands. The amateur maker should gain a physiological insight into the lactic portion of animal anatomy, and

have an intelligent comprehension of the active force of the peptic secretion. When such knowledge is acquired he will see the importance of never countenancing any coagulating fluid that is not immaculately pure in extraction and free from any subsequent taint. He will also understand its nature enough to always make a judicious application of it to the milk designed for manufacture. Here the necessity of step No. 1 joining hands with No. 2 is apparent, for he cannot make a judicious application unless his olfactory sense is trained to perceive and gauge every variation of the milk quality. Necessity No. 3, is in following the quality variation of milk into the cooking and maturing curd. It is a well-known fact with cheese makers that no two vats of curd will scarcely ever work exactly alike in succession. If one is to know absolutely just what to do and what to leave undone at certain moments of assimilation and maturity in curd, he must have gained that knowledge not from books but from continued practical experience. Here the necessity for previous learning arises. No pettifogger would be expected to argue legal points before the Supreme Court, because lack of advancement in the rudiments of his profession would make him as unfit for such a pleader as a farmer or merchant. Every man to his business, and no man to be trusted in any trade capacity until he has proved himself competent. So, if an amateur lawyer or doctor is not to be trusted, why should responsibility be placed on the shoulders of a green hand at cheese making? He is expected to properly prepare an important article of human food, and, inexperienced and ignorant of the rudiments of the trade, he stumbles along in the dark, doing, perhaps, the best that he can, and not so much to blame for the failures that accrue as are his employers.

Wide dispersion of training schools for both butter and cheese makers is not far off, and I, for one, hail that day with delight.

WHERE OUR CHEESE GOES TO.

After contemplating the immensity of our annual cheese output, the question naturally arises, "Where does it all go to?" The earliest shipments of American cheese were made from New York to England in 1835 and 1836. The beginning was very limited; shipments of cheese were made in casks; $60,000 would probably comprise the value of all shipments made in those years. As England still remains our principal foreign customer, we will come down to the year 1882 and give the official figures of the port of New York of the annual receipts and exports. We do not mean to intimate that England takes *all* of our exports, but she absorbs the major portion of them.

	Year.	Receipts.	Exports.
Receipts of Cheese in New York,	1882,	2,350,559	1,898,192
" " "	1883,	2,456,232	1,957,967
" " "	1884,	2,407,550	1,932,702
" " "	1885,	2,122,187	1,658,696
" " "	1886,	1,943,260	1,575,262
" " "	1887,	1,994,857	1,450,955
" " "	1888,	1,993,462	

The 1888 export is not recorded yet. It is hard to get at the home trade quantity used throughout the country. There are many cheese distributed from factories to neighboring towns in Ohio, Wisconsin, Michigan and other states of which no account is kept, and there are no statistics covering the entire make, but at a guess we should say it was about 4,000,000 boxes annually. The cause of decline in receipts at the port of New York since 1882, is largely due to the fact that a good many cheese made in the northern part of this State (N. Y.) are bought by Canadians and shipped *via* Montreal. It is said that Englishmen eat twelve pounds of cheese *per capita* a year, while Americans eat three pounds. Cheese consumption is, however, on the increase here, as the healthy and nutri-

tive qualities of the product are more and more appreciated. One of the most serious drawbacks to universal cheese consumption is the large profits exacted by middlemen when they dispense it to the public. If cheese could be had at the grocery for 9 or 10 cents per pound instead of 14 or 15 cents, it would be found in abundance on the poor man's table, and a heavy decrease in the export trade would result. We believe that such a time is coming, and with it will come a vast improvement in the average quality of the national make. This is not a mere speculation, but a distinctive pointer of the times, and its verification is already at hand. Thirty-five years ago the innovation of the cheddar process gave cheese quality its first great advance. That advance remains yet to be perfected in detail, and then a cheese millennium will reign.

MOISTURE IN CHEESE.

One of the most essential points in determining the quality of a cheese is the amount of moisture it contains. A proper retention of moisture by the product in a cured state depends primarily on the rennet that separated it from the watery serum of milk, and secondly on the amount of heat applied in cooking, and the quantity of salt afterwards added. To adjust all these little niceties to a minimum of fine, even quality of which moisture is an adjunct, requires experience and long familiarity with the handling and treatment of milk. Butter, moisture and caseine should exist in about equal parts to make a mellow cheese, and, to fix the proportion rightly, enough rennet should be incorporated into the milk to expel all excess of moisture, and yet leave enough to withstand the effect of a heat judiciously gauged to cook it. Thus, rennet influences moisture on the start, and other forces afterward are introduced that either aid or retard it. When rennet diffuses itself

through milk its power and potency are largely measured by the temperature of the fluid body surrounding it. As cheese making is merely an imitation of nature's workings in curdling milk in a calf's stomach, the nearer we can follow that process on the start, the closer to perfection we get. Long experience has demonstrated that a temperature between 80° and 85° Fahrenheit is the best degree of warmth for milk to have attained when it receives the peptic fluid. A temperature above that expels the butter globules into the whey, and below, the active principle of rennet is not brought out and tardily and incompletely coagulates the mild solids. By afterward applying the lowest degree of heat that will cook it within a reasonable time to a consistency of contraction and expansion, the moisture still remains in proper proportion. A few degrees of excess heat will produce a dry, hard curd, and a future dry, hard cheese. Judgment, discretion and experience are necessary in applying salt to retain moisture. Salt itself is, of course, a moisture retainer, but a too heavy application hardens and stiffens the cheese structure and retards the curing of the product. Never salt more than enough to give and retain flavor and preserve quality. If the points we have given above have all been observed, then the proper proportion of moisture in cheese will be assured.

Prominent English cheese judges have passed verdicts on fine cheese in the following words: "We want cheese rich, solid, fine flavored, true colored, that is, of an even color throughout, sound, handsome, that will go on to improve for twelve months or longer if desired." "A good cheese is close and firm in texture, yet mellow; in character or quality it is rich with a tendency to melt in the mouth; the flavor full and fine, apparently that of a hazel-nut." "The characteristics of a good cheese are mellow and rich in taste and flavor, and firm and full in texture, solid but not tough." "A good cheese is rich without being greasy, with a sweet, nutty flavor,

clear and equal color throughout, and of a compact, solid texture, without being waxy; firm, and yet melts easily in the mouth, leaving no rough or ill flavor on the palate." The English conception of peerless cheese is ours, too, and we must continue to grind away on the road of improvement until we bring the united product to the standard of unimpeachable quality and uniformity.

RULE FOR MAKING OUT DIVIDENDS.

Many makers are now expected to figure out the milk dividends for the patrons, and issue fortnightly statements. A quick, easy rule to follow in doing this business, is to first foot up each patron's milk for the number of days' delivery in one or two sales, as the case may be, draw a line across the page of the factory account book opposite the date sold up to, and, as you add each man's milk, set the amount down opposite his name on the tally slate. After you have summed it all up, go over it again, adding from the top of the columns downward. This will correct any mistakes you may have made. Next, add the separate sums of milk together into one grand total and, using this united sum for a dividend, take the number of pounds of cheese in the sale or sales for a divisor, and the quotient will be the ratio or the number of pounds of milk it has taken to make a pound of cheese. Then, multiply the number of pounds of cheese by the price per 100 pounds you get for making, and deduct the product from the full cash amount that the cheese has brought. The residue money divide up proportionately among the patrons as follows: Using the grand total of milk for a divisor, see how many times it is contained in the money, minus cost of making. The quotient will be the net price of one hundred pounds of milk. Multiply each patron's separate amount of milk by this price per hundred pounds,

and the product will be the net monied income on that sale or sales for the patron. In getting the price of a pound of milk it is seldom necessary to carry decimally beyond mills. In a measure, the work all proves itself, for, if, by adding together the face value of each patron's check, the amount does not agree with the cheese returns, less making, your figuring will need a review.

It is customary now to send out with each check a statement demonstrating and setting forth just how the factory business is running. Thus, each patron becomes a critic of the secretary. I append a statement properly filled out:

SALE STATEMENT.

Plainfield, N. Y., June 20, 1889.

E. W. WRIGHT'S CHEESE FACTORY.

IN ACCOUNT WITH

MR. JOHN WILLIAMS.

Sold from May 14th to 29th.

No. Boxes,	168
Total Milk,	69,779
Total Cheese,	7,026
Price per pound, 3,434 @ 8¼c. 3,592 @ 8½c.	
Ratio,	9.93
Net price per 100 pounds Milk,	71.3
Your Milk,	8,336
Amount less making,	$59.43

THE WHEY VAT.

The whey vat may be regarded as a necessary evil, but with means at hand to relieve ourselves of some of its putrefactive characteristics. We trust that the day for having this swill tub harnessed to the factory will soon be an item of the shady past. Whey is all right in its place, but its place, as soon as it is drained from the curd, is a long distance from

the factory building. I would place the whey vat ten rods away from the factory, and if night delivery of milk was the rule, I would move it *twenty* rods off. Get it at least beyond contaminating distance, and then have the whey carried to it in open tin troughs. If the troughs are thoroughly painted you need not fear rust, and as they are of metal they cannot dry up, warp and leak. Have the spouts about the factory perfectly tight so that no whey can fall to the ground, for it is fearful stuff to generate offensive effluvia. Try and keep the whey receptacle as neat and clean as possible. Have it roofed, but open on the sides. Skim the cream from it every morning, and it would be much better if you would churn it fresh instead of keeping it for weeks to be rendered out in a kettle by fire. Scrub the vat out every day with a broom; it will take five minutes' time and a pailful of hot water. Make it a rule for each patron to draw away no more than three pails of whey for every hundred pounds of milk delivered. Also, make it a rule to yard nobody's pigs or calves about the premises for convenient whey slopping. Insist on it that if your patrons insist on drawing sour whey home in their milk cans they put on extra "elbow grease" afterward in cleansing them. A cheese maker hardly likes to make the imputation to patrons that their wives are not neat (only, perhaps, when they are in a great hurry) about scalding out the sour whey from milk cans, and yet such insinuations on his part are often necessary.

WHYS AND WHEREFORES.

Curd is first cut with the horizontal knife, to facilitate easy expulsion of the whey.

Cheese is a good edible, because, besides being highly nutritive, the rennet or gastic juice it contains aids digestion and the assimilation of other foods.

Whey should never be fed to cows, because, having once been secreted in their mammilary glands in the form of milk, it has now taken on the nature of an excrement; consequently, a re-secretion would be highly prejudicial to the quality and healthfulness of the product.

It was formerly supposed that febrine was exclusively a constituent of animal blood; but now the theory that slight traces of it in milk induce rennet coagulation is generally accepted as authentic.

If a cheese is misshapen, by uneven pressing or otherwise, when taken from the hoop, put it back and press it over again. Remember that appearance goes a long way with dealers. Do not tolerate any cheese in the room that are deformed.

Cheese makers should insist that patrons with large messes of milk set their night's yield in two cans, thoroughly air the fluid, by stirring or dipping immediately subsequent to milking, and then dump both portions together in the morning, so as not to mix night's and morning's milk until it is mixed in common in the cheese vat. If this rule is insisted upon and faithfully observed, a great deal of damaged milk will be avoided.

A quack doctor should as soon be granted a diploma to practice, as an ignorant apprentice at cheese making be given the responsibility of the manufacture of a vat of milk. The health of the community is in great danger from both frauds.

Cheese that are surface mottled, spread the bandage and show a soft, weak rind, have been insufficiently cooked. The remedy lies in a more upward tendency of the mercury.

The art of cheese making cannot be learned wholly from paper, because variations of milk quality constantly clash with regular modes of procedure. Here the practical experience

and sound judgment of the maker must intervene and offset the lacteal variation, by appropriate changes in the manner of working the product.

Making good cheese out of poor milk is much talked of by makers and considered quite an accomplishment. It consists in clothing the product in a glamour of deception, propagating dyspepsia and shielding careless dairymen.

Skimmed cheese is dry and tasteless and unfit for human food, because the meat has been extracted, and the shell left. It should take a back seat on the bench of humilation beside oleomargerine.

When whey sparkles it is sour.

When raw curd settles quickly after being cut up, it is a signal that it is aging rapidly and developing acid. White scum on the whey indicates the presence of acid.

Butter exuding slightly from the hoops of pressing cheese tells of acid and bespeaks a fine quality of goods. Butter exuding in excessive quantity from the hoops is proof that the milk has either been violently shaken up over rough roads or has been set at a very high temperature.

You cannot get a good rind on a poor quality of cheese; you can always have a perfect rind on one of good quality. Thus, in one sense, the rind indicates the quality.

"Cleanliness is next to godliness" about a factory, because, milk being an animal fluid it is of nitrogenous composition, and the waste that accrues from it on decomposition becomes the most fetid carrion.

Buttermilk added to sweet milk in making cheese is a diabolical habit, the object, nowadays, being not to produce cheese from slop but from pure, wholesome milk alone.

Airing curds thoroughly after salting is necessary to expel gaseous odors. The improved quality of the cheese will repay every maker for doing it.

Never cease to agitate the question of only six days' labor in the week for the cheese maker. Agitate it, because God has laid it down as a commandment for all mankind, and nature inexorably exacts from the physicial forces every violation of the rule.

Keep the curing room at an even temperature of from 65° to 70° Fahrenheit, because a less amount of heat might sour the green cheese on the shelves and more warmth might cause them to lose butter to the point of off flavor.

Keep the surface of cheese impervious to fly attacks and you will never be troubled with skippers.

Never use sour press clothes on cheese, not only from sense of neatness, but because the rank acid will check the rind.

If you are caught with a soft curd on your hands, one that has soured so quickly that you have had no opportunity to give it a firm cook, grind it twice and stir it more than usual. This will reduce pulpy lumps, add stability to the curd and prevent the cheese from spreading out of shape in the bandage.

Rennet is the life and soul of cheese, as much depending on its efficacy as on yeast in bread. Excessive heat stifles and kills out its virtue and leaves the cheese structure dead and indigestible. Makers should bear this fact in mind and never allow the cooking curd to rest long on the bottom of the vat.

The rennet jar should never be covered, as nothing can be mentioned that is more liable to contract fetid taint than these skins. Exclusion of air from the vessel in which they are soaking is extremely liable to spoil them in spite of the salt the liquor contains.

In weighing patrons' milk at the factory, the scales should be balanced down and up weight taken. To the uninitiated this might at first seem an injustice, but a little experience will soon show that it is imperatively necessary. The dealers to whom the cheese are consigned exact stiff up weight, and

if the same is not taken at the milk delivery window, woe be to the ratio. As all patirons are served alike in the premises, no loss or injustice accrues to any one and the maker is in a position to deal as he is being dealt with.

Pulverize salt thoroughly before sprinkling it over the curd. Hard lumps will not dissolve and will produce cauterized spots through the cheese.

During the hot weather of summer remember that curd will stand a third more souring, and yet come down into mellow cheese, than it would earlier or later in the season. Bearing this fact in mind gives a maker mental relief when he has a curd that has the start of him on acid and yet afterward comes out all right, perhaps making the best cheese in the room.

Saving curd over to mix in with the next day's cheese is not desirable, but it is often unavoidable, as cheese of as even weight as possible are always wanted. Take the curd to be saved over and put it in a bag of bandage cloth. Mix into it an extra handful of salt, in order to prevent too much souring, and hang the sack in a cool, dry place. The next day, just prior to drawing the whey, empty the old curd into the vat and stir it up with the new.

There are sometimes extreme cases of butter separation from the cooked casine. I have seen where butter would settle in the seams and cavities of cheese, to the almost utter ruination of the product and the distraction of the maker because he could not discern and stop the cause. There are many causes, some of which are beyond the power of the maker to remedy, such as churning the milk in drawing it to the factory over stony roads, etc. But he can prevent too high heat at setting time, and he can manipulate milk with gentleness before the rennet is added.

In consigning cheese to market always put the consignor's on the side instead of one cover of the box. Covers are apt

to come off in transit and get mixed with those of other consignments, entailing much trouble to those concerned.

When coagulated milk has reached the right consistency to cut up, draw the curd knife through it at a moderate speed, truly and unwaveringly. The cutting behind an experienced hand will expel whey clear and green in color. In this item of procedure let your hand be counted among the experienced.

POTENT MAXIMS FOR THE CHEESE MAKER.

Keep a perfectly sweet, clean vat and spotless, shining apparatus and utensils.

Make an olfactory test of every mess of milk before it is dumped into the weighing can, and reject all that is tainted, unclean or tending toward the sour, as by the acceptance of such injured milk you damage your own trade reputation, detract from the dividend of every patron who furnishes perfect milk and irreparably wrong every consumer of the cheese.

Insist on each one of your patrons straining their milk through a fine cloth strainer of double thickness, and use the same yourself for it to pass through into the vat.

In heating up your milk to a temperature to meet a reception of the rennet, stir it frequently and gently.

Never set above 86° Fahrenheit in spring and fall and 84° in summer.

Remember that too high heat before setting separates the butter globules from the milk structure and that they are subsequently lost in the whey.

Use nothing but stone jars for keeping rennet. If a mess of rennet worth, perhaps, a dollar should get slightly tainted, throw it away rather than impregnate it through $200 worth of cheese and cause serious illness among numerous human beings.

Use only annottoine cut directly from the seed by the chemical action of potash.

The imputation that urine is used in the paste preparation should make every manufacturer shun it with loathing until the vile stigma is disproved.

Be at least five minutes in stirring the rennet into milk. Stir it with great gentleness, so that the butter globules will not be displaced.

Curd should stand not less than forty or more than sixty minutes after the application of rennet before cutting, the variation in time to be governed by season, condition of milk and desired keeping qualities. Curd is fit to cut up when it will split clean before the finger but is not so brittle as to break before the advancing knife. Cut first with the horizontal knife lengthway, then crossway, then lengthway with the perpendicular blade. If milk is very ripe, and a quick scald is necessary, cut once more crossway with the perpendicular blade. Never slash curd in cutting, as it starts milky whey and lowers your yield.

After cutting curd if milk is in normal condition, it is, perhaps, better to agitate the curd gently for a few moments before heat is applied. If milk has already taken on acid, apply heat immediately after cutting. In agitating curd use the hands for the first fifteen minutes, then manipulate it with a rake.

Stir only enough to keep it separated and prevent it from scorching on the hot bottom of the vat.

Remember that cooking curd thoroughly is, without doubt, the most important part of the whole programme of cheese making.

Do not place sole reliance on thermometer figures—let your judgment rule supreme above that. See that every day's curd—the product of milk in all stages of maturity—does not part with the whey until it is cooked to a state of

contractibility in which the cubes will separate by expansion after pressure by squeezing in the hand. No maker considers his bread free from rawness until it has received a certain amount of heat in the oven, and no cheese maker can expect to get a mellow, firm cheese unless he cooks his curd as above described. By using the smallest amount of heat possible to cook curd within a reasonable time, a finer quality of cheese is secured and a better yield.

Hold curd in the whey until it will string fine threads, one-fourth of an inch in length, on the hot iron.

Aim to have the whey well drained out of the curd before it is ground. Do not grind curd when it is too hot. If necessary, cut into small blocks or strips and scatter over the bottom of the vat, to cool to a temperature to about 85° Fahrenheit before grinding.

Cheese makers should not be too much wedded to fixed rules. For instance, do not always hold curd in the whey until it shows a quarter of an inch of acid by the iron simply because it may be a rule. Let your judgment rise supreme over all rules. Frequently, through the summer there are cool nights when the milk keeps so sweet that the next day no acid will show by the time you have the curd thoroughly cooked. At such times, as an experiment, draw off the whey sweet and let the curd develop acid in the pack. For your particular locality, quality of milk and character of feed, such a method may produce finer cheese than if soured in the whey, and it may not. You must test all of these little details to find out.

Two pounds of salt and the fractional parts of a third pound, up to sixteen ounces per 1,000 pounds of milk, covers the cheese maker's scale for the season in this department. As a rule, two pounds in the spring, with a gradual ascendancy in quantity as the apex of hot weather approaches, and then a declination in quantity toward fall, is about the

average amount used per 1,000 pounds of milk for the Cheddar process. There are more makers who do not salt above two and a half pounds in hot weather than there are who use three pounds. High salting retards curing, and the object now is to get a new cheese onto the market as quickly as possible. With a wet curd salt a little more than the rule by which you are running, so as to make up the loss that goes out with the whey.

CHEESE FOR THE BRITISH MARKET.

This quality of goods, generally known as "shipping cheese," is made by the same process that we have described in this book with the exception that it is, or should be, worked down more. "Worked down" implies that a firmer cheese is produced, one cooked more, salted a trifle higher and soured more. These requisites lend a cheese body and prolong its keeping qualities. With all this, it must be mellow, close textured and fine flavored. The English consumer wants such a cheese, or he wants none. "A word to the wise is sufficient."

SKIMMED CHEESE.

Making edible skimmed cheese is an effort to supply a constituent for the product that does not exist, namely, oleaginous matter. The butter or cream in milk is what gives rich flavor and mellow body to cheese. When a part or whole of this is removed by the skimmer, the depleted fluid, if manufactured into cheese, just as that containing all of the cream would be, will make dry, tasteless stuff. Skimmed cheese must be cooked, soured and salted less than full cream. Flat skims can often be scalded at 93° and 94° Fahrenheit. But, of course, this must be governed entirely by the rules relating to thorough cooking.

FLOATING CURD.

Floating curd emanates from the rankest known species of tainted milk. The curd is surfeited with offensive, poisonous gas, that holds in check the acid and will inhabit the curd until its life has died out. All the cheese maker can do is to wait patiently until its existence has ended and the curd, ceasing to be inflative, develops acid. Then grind and salt the usual amount, airing by thorough stirring for an hour or more, with doors and windows open, to expel the taint. Let it sour in the pack. If ground and salted before gas has left it, the cheese will huff up like puff balls.

BOXING CHEESE FOR MARKET.

After the cheese designed for shipment are selected, examine every one and look to it that there are no surface shortcomings; if there are, the discrepancy must be remedied. Aim to have the cheese go into the package neat and attractive in appearance. A firm, elastic rind, well oiled, and a spotless bandage cloth, if forming the cuticle of a squarely-built, well-shaped cheese, is all in the line of the appearance that is desired by dealers and retailers. In weighing the cheese, give good up weight, taking no account of anything less than a pound. Use the best quality of scale boards and boxes obtainable, and have the latter fit the cheese snugly. After a cheese is weighed, place a scale board on the top end and shove a box onto it. Flop box and cheese over and, as the latter settles into the case, mark the weight on the side of the box. If the box is too high, shave the rim down to the cheese surface and place on a scale board and then cover. It is imperative that the covers fit tightly and snugly, and that any superfluous rim on the box be shaved off. No cheese is

properly prepared for transportation unless it is so tight in the box that it cannot shift and knock about. Brand the boxes in a neat, workman-like manner, having the lettering show plainly and distinctly. Then your cheese are ready for the freight car or the vessel's hold.

Cheese are often slightly mouldy on their bandaged sides when cured in damp, warm weather. To obviate this, when boxing, rub the sides thoroughly with a dry, soft cloth and do not box until just before shipping. No cheese should be placed in boxes in hot weather until a few hours before transportation. Standing for several days in tight packages and exposed to a high temperature, will not only try the quality of cheese but will positively injure the flavor of the very best. If they could all go to their destination in refrigerator cars, this evil would be greatly ameliorated. With the facilities at hand, however, aim to place them on the market in as neat a shape as they rested on your curing room shelves.

THE HOT IRON TEST.

I do not know what cheese makers would do nowadays without the hot iron to guide them in evenly maturing curd. It is one of the most essential attributes of making. It should, of course, be most judiciously used.

In 1845, Mr. L. M. Norton, of Goshen, Conn., discovered that the acid in curd could be gauged by stringing threads from a heated iron. He kept the discovery a secret for a long time but at last divulged it.

To supply yourself with a handy instrument for testing acid, take a three-quarter inch bar of iron a foot long and set one end into a ferrule on a wooden handle. It can then be conveniently handled without burning the fingers. Heat the metal a little hotter than desired and then thrust for a moment

into a bucket of water, to thoroughly clean the surface. Holding it in the left hand, take a piece of curd squeezed dry of whey and press against the iron. If it does not adhere at all, the curd is perfectly sweet, no matter how it may smell to you. If it clings slightly, you may be assured that acid is beginning to develop, so keep close watch of it. Curd ought never to string out threads more than one-fourth of an inch long before whey is drawn, and oftentimes less is desirable.

Have the iron at just the right temperature or you cannot make an accurate test. A right temperature implies that the iron is so hot that the curd will fry around the edges when pressed against it, but not so hot that it will scorch over.

Tainted and floating curds will often string threads six inches and more in length, and then not be fitted to grind and salt. As soon as acid has overcome the gaseous condition of such curd so that the inflation will subside, it is ready to grind, but not before. Cheese makers should not be afraid of souring and airing such curd too much.

MILK.

In the manufacture of cheese the constituents of milk demand our first attention, as we cannot intelligently study a subject without investigating its primary principles. Cow's milk contains:

Water	864	parts.
Nitrogenous matter (caseine and albumen)	43	"
Sugar of milk	52	"
Fat	37	"
Mineral salts	4	"
	1,000	

The solids represented above are in the form of minute globules, and the serum in which they float is the water or

"whey." It is to unite these globules and separate them from the whey that is the primary function of cheese making. It so happens that rennet, the active agent in this process, besides exerting an automatic, chemical action on milk, imparts to the solids new and vigorous properties that give cheese a medicinal value to the human stomach, namely, an inceptor of digestion. It is imperative that a cheese maker understands enough about milk to instantly detect the slightest change from its sweet, pure, normal condition. Milk as a fluid is highly sensitive to unclean odors, and when it absorbs them in a greater or less degree, the maker should, by an olfactory test, discover the taint. Milk that has been tainted by a retention of the animal heat, not having been cooled when freshly drawn, will give off a rank, burned smell, nauseous in the extreme. If the taint was absorbed from odors, the peculiar scent of the particular stench will be indelibly impressed on the fluid. Mature or sour milk is more to be desired for cheese manufacture than milk poisoned by taint. In fact, a *slight* maturity of milk is necessary—or, at least, desirable— to produce a fine cheese, the same as mature cream is required to develop good butter, only in the former the "ripeness" must be scarcely perceptible, while in the latter it must be well advanced. All tainted milk, and all milk that is "old" and nearly sour, should be unconditionally rejected at the cheese factory for manufacture. Do not be afraid af financially losing by such a rule. It is none too stringent, and in the end it will give your goods a trade reputation that will be secure and impregnable. The idea that really good cheese can be made out of poor milk is disproved by chemistry and common sense.

SALT.

One of the most important factors in cheese making is the saline mineral known as salt. A cheese can be manufactured

gilt-edged in every way, but if it contains no salt, an insufficient quantity of it or that which is of weak, inferior quality, it is simply a mass of perishable, nitrogenous matter that will soon go to putrefaction. Salt checks the growth of the lactic acid as quickly as a rush of air snuffs out a candle; therefore, it has complete control over the quality of the cheese in this direction. It preserves that quality for an indefinite time, provided it exists in a sufficient proportion and the cheese has been scientifically made. Then, again, salt gives firmness and flavor to the cheese.

Thus, perceiving that cheese, as a component of human food, could not exist without salt, the analogy between the purity of that article and the fine quality of cheese is at once apparent. It is needless to advise the use of nothing but a fine, pure grade of salt for savoring cheese. Perhaps, instead of needless, it is *needful* to admonish manufacturers in this regard. I regret to say that I have observed many who held false ideas of economy about so cheap an article as this briny product. A difference of twenty-five cents on a barrel would turn their judgment in favor of the cheaper, coarser article, and, while really the losers thereby, they would feel complacent over a supposed gain.

It is just such little slights as this—substituting poor for good salt—that help make up the discrepancy in quality already perceptible in American cheese. The dairymen of this country possess the most advantageous position of any class of dairymen in the world. For years their milch cattle have been bred toward the extinction of beef characteristics, and toward the fostering and enlargement of lacteal tendencies, until now, in point of blood, the general average is high. Intelligence, skilled labor and ingenuity are at command and should so leaven the products of our dairies that they should stand above all competitors. Then, why be "Penny wise and pound foolish," when so grand a prize as national trade repu-

tation is at stake? Cheese manufacturers, employ only the most experienced and careful help obtainable, and be willing to pay them liberally for their services. Look only to *the quality* of your cheese and let the ratio take care of itself. No matter if it takes eleven or twelve pounds of milk to produce a pound of cheese, provided that cheese is gilt-edged in every particular. Use nothing but first-class material, from the rennet, coloring matter and salt that goes into the cheese to the scale board and the box that covers it. Let the foreign demand wane if it wants to—we know how to relish good cheese here at home just as well as our English brothers, and, in the future, we are going to consume more of the product *per capita*, too.

HOME-MADE CHEESE.

Exhaustive rules for manufacturing cheese on a small scale at home occasionally go the rounds of the agricultural press. Some of them contain ideas of real merit and some do not. All middle-aged people who have in younger days lived in localities where dairying reached even modest pretensions can recall the sweet-savored cheese room, an adjunct of the kitchen, whose furnishing of primitive milk utensils was then considered ample for the housewife's use. Associated dairies or factories soon came upon the stage, and their vast superiority of method, coupled with the adoption of the cheddar system, marked an era in cheese improvement, which said in effect, if not in words, that "home dairy cheese must go." The innovation of factories undermined and swept out of existence this small fry of amateur production, because home dairymen would not or could not adopt the cheddar improvement and manipulate their milk with skilled labor. Dairies associated together under factory regime facilitated such an easy and quick disposal of one's milk, and at such a

greatly enhanced profit, that the obvious convenience and economy of the new order of things, more than any inimical characteristic it possessed, pulled down the one and set up the other. It matters not, though, to consumers in America or England, whether the cheese they eat is made under the roof of a farm house on a small scale, or in a mammoth factory on a large one, provided the quality is good. But there are serious drawbacks about making up milk in diminutive quantity that are hard to overcome. Let us discuss them and analyze their leading features:

I think it is safe to assume that not one person out of fifty who attempts to make home dairy cheese to-day but will manufacture it just as his fathers did fifty years ago. In their minds the whole process is covered by coagulation of the milk, quick cooking of the curd, salting it and pressing it. There is no thought of having the milk moderately mature, the curd thoroughly cooked and then properly soured, and the salt judiciously applied. The amateur knows nothing about the fine yet necessary points of manufacture, and so his cheese lacks the fine but requisite points of quality to insure it trade recognition. We all like good cheese to eat, but in this country, thanks to the skimmer, it is getting so that the good article is very scarce and promises to be scarcer if the skimmer's relations with the factory are not soon done away with.

A great many readers who live in non-cheese manufacturing districts appreciate mellow, rich cheese when they sometimes at long intervals find it on their groceryman's counter, and vow that they would eat the article more if the price was cheapened and the general quality raised. You should, if you live a hundred miles or so from any factory, and if you have a few cows and your neighbor has a few more, club together and make up some cheese for your own use. You have a vivid remembrance of how your mother used to manage it years ago. Discard the wooden tub that she used, for now

we have tin vessels that are far preferable. Get two or three hundred pounds of milk together, if possible, but do not rob it of a bit of cream—keep that well worked into the fluid. Have a heavy bottomed tin box with round corners, made at the tinner's, one that is so shaped that it will fit into a large caldron kettle and yet leave a couple of inches of space between its outside surface and the iron sides of the kettle. This space is for water, which should be used as the best conductor to raise the temperature of the milk. Set the kettle in a brick or stone arch, in which kindle a slow fire. With the tin vessel filled with milk, and water about it in the way described, you have a cheese vat in miniature. Have a thermometer handy. Stir the milk often and do not let it get above 85° before setting. Draw the fire out before it has fairly reached that temperature, as the after heat will raise it a degree or two. Do not trust to your knowledge of the strength of rennet. Buy some rennetine and carefully follow directions as to the amount necessary to coagulate 100 pounds of milk. Work the rennet in thoroughly and then cover the little "vat" up with a piece of sheeting. It is very important to have just enough rennet as too much or too little will spoil the cheese. Have your tinner make you two curd knives, one with perpendicular and the other with horizontal blades. When the coagulated milk will break squarely over the finger, and whey begins to start around the edges, cut it quite finely with the knives, using first the perpendicular and then the horizontal one. Raise the temperature slowly, not to 100° or 110°, but to a point where the curd is thoroughly cooked but not to dryness. Stir the curd and whey up at frequent intervals to keep it from packing. Do not hustle it into the press now just because you have it cooked, unless it is sour. Remember that the curd must mature, or, in other words, generate acid. Therein lies the future good quality of the cheese. Do not rely on your olfactory sense to gauge the sourness. Press a

little piece of the curd against a hot iron. When it pulls out strings one-half of an inch long in spring, one inch long in midsummer and one-half inch in fall, it is sour enough to be salted. Have the whey all dipped off and the curd drained before it has reached a maturity sufficient to salt. Do not salt in hot weather higher than one-fourth of a pound to a hundred pounds of milk, and in spring and fall less. As you have, at the most, only a little curd to manipulate, do not let it get cold but put it in the hoop at a temperature of at least 75°. Do not try to save over curd for another batch the next day. Better have two twenty-pound cheese in two days than one forty-pounder during the same time. You cannot graft new curd onto old without lowering the quality of the whole. After you have a curd in the hoop do not try to press it with stone weights because there is so little of it. Have a small press frame and a screw for that purpose. These small cheese will cure quickly. Keep the ends well oiled, and lay them on a shelf in a warm room, where they should be turned and rubbed every day.

The foregoing pointers are intended for persons who have some previous knowledge of making dairy cheese, and, therefore, minute details of explanation have not been given. The trouble with most home dairy makers is that they do not realize the importance of souring the curd, and so make weak, off-flavored, perishable stock.

OCTOBER CHEESE.

How are we to make as good cheese in October as we have been turning out in September? This is the mental query that will sometimes arise in the minds of makers whose experience is not measured by length of years. A one-twelfth turn of the wheel of the yearly chronological table ought not to produce such a vast change in lacteal affairs as to exert a

radical change in the manufacturing process. Of course, the artificial subdivisions of the season would be of but small moment in the case if they were not to a certain extent analogous to natural atmospheric changes. As September wanes into October the summer is insidiously but surely attaining its maturity. The grass roots having in a prolific manner fulfilled their annual mission, fail to send forth the tender blade of earlier months. Blighting frosts sear the pastures and sap the succulence from the feed. It is but natural that such an alteration in climatic influence should leave its effect on the milk. It is a maxim of cheese making that you must work milk according to its condition, not expecting one invariable rule to cover the whole science, but keeping in mind numberless distinct methods of treatment, for instant application as exigencies arise.

As a general thing, less acid is deemed necessary for the October make than was applied to the September product. I believe that in making this important change the majority of manufacturers are too abrupt in method and reduce the standard of ripeness prematurely in point of time. A certain amount of acid is necessary to impart flavor and insure good keeping qualities, hence more of it is required in hot weather than in cold, as a defense against high temperature. Many think that as soon as the hot days are passed the need of an advanced curd maturity is passed also, and make almost sweet cheese. If there is any thing that is fraught with dire consequences in cheese making, it is extremes practiced in the *modus operandi*. Avoid anything so derogatory and let conservatism characterize your movements. Despite seasons and weather, and climate, we have got to apply just so much acid to cheese to make it palatable and mellow, and if the product is liable to encounter crucial weather enough more sourness to retain the flavor established is imperative. But what weakens fall goods is that in decreasing the acid scale

in view of cold weather ahead the retrograde is pushed beyond its own needs and infringes on the quality of the cheese. In their zeal to have the standard just right, I have known old makers to produce a lot of weak October cheese before they realized where the trouble was. Better have a little fullness of acid on fall stock than not enough. "Doctor, why is it that you always buy a late fall cheese for winter family use?" was asked one of the medical fraternity by a factory employee as he delivered a forty pounder at his door. "We have in my estimation far better goods on the shelves made in August and September, and the price is the same." "Well, you see, young man," said the Doctor, pouring some quinine into a vial, "I have a notion that late fall cheese is healthier; the milk is no richer, perhaps, than in September but the air is cool and pure, and, of course, you know what a debilitating effect heat waves and miasmatic atmospheric currents have on milk. Well, the less poison there is in the air, the less there will be in the milk and subsequently in the cheese, consequently my choice." I believe the man of pills argued in the right direction there, but then there is happily a way of expugning from the curd infections absorbed by the milk from the atmosphere, namely, airing.

The most diabolical enemy of October cheese is the skimmer. In factories where that is unused there is a clear field for developing fine stock, but there is no concealing the fact that all attempts to smooth over the impoverishing effects of its use by the most skilled treatment are futile and unavailing. If all of the good endeavor to make mellow, rich cheese out of substance that is but dross was expended in divorcing the illegitimate union of creamery and cheese factory, incalculable benefit would accrue to dairy interetes.

This month avoid cold draughts through the make-room during the scalding process, as a vat presents a large surface for a current of air to exert a chilling effect upon. Be sure

and cook the curd enough. There is a vast amount of fall made cheese that comes to grief through insufficient scalding. If you do not bake a loaf of bread thoroughly, you have a doughy and unpalatable article of food, and if curd is not cooked until it has passed the raw state, it will retain a certain quantity of whey and damage the product on the shelves. This is the cause of strong-flavored, flabby-textured cheese. A gentleman of long experience in the trade has said: "The truth is, as it is difficult to cure cheese in cold weather, it ought to be cooked more than will answer in hot weather, and sour less, as the tendency is to acidulation in a cool atmosphere, in consequence of the moisture not drying out soon enough." To this we can append the suggestion of never trying to cure a cheese in a cool atmosphere, for the result will be a failure. A cheese cannot help but grow old in a cold room but it will never cure.

A SIGNIFICANT REPORT.

A recent issue of the Utica *Herald* contains the following:

A New York gentleman, who has recently returned from Liverpool, writes to a friend in this city and reports the situation healthy on the other side, but says New York State cheese are done for as far as fine cheese goes. It is the same old trouble we have mentioned time and again, too much cheese to the pound of milk—no body. Canada, and even New Zealand, are taking the trade of fine cheese from the States. Our factory men will wake up to the fact some day and find their goods are only second class. In fact, it is about so now. New York State cheese sell under Canada all the way from ½ @ 1c. a pound. We have preached this a long while but it is beginning to to be realized now. This accounts for the large shipments from Canada during the last two months, and the small ones from here.

Cheese industry is not yet of sufficient magnitude to exert any marked influence on the European markets, but

as the dairy industry is constantly expanding here, and the State's product must stand on its own merits, it behooves manufacturers to avoid the pit that their brothers of the Empire State have inadvertently stumbled into. We consume a large amount of cheese here at home, and why are not our stomachs as worthy to be catered to as are the digestive receptacles of our English cousins across the pond? Yet there is no alarm in cheese circles as to deteriorated quality until British buyers find something that suits them better and for which they are willing to pay more. Truly cheese-eating New Yorkers are a very patient people. We have before us the file of a leading American cheese report of 1868—twenty years ago. It says: "We are behind the Canadians as regards firmness, but ahead of them in point of flavor. The same relation exists between American and Swedish cheese; also, between American and English cheese, and other European makes, with the exception of a few of the best English brands, which are equal if not superior to our finest grades, as regards flavor, and superior in fineness and firmness of texture." This was America's prestige a score of years ago. Why has it not been sustained? The cause is clear to the most obdurate. Producers supposed their cheese supreme in the English markets and have been abusing an established trade reputation with impunity. Their folly is now apparent, and the question naturally arises, Will they play the *role* of the prodigal son and return to a path of trade rectitude? That implies that the banns that unite the creamery and the cheese factory be irrevocably severed—send the skimmer higher than Gilroy's kite, as it were. The American people can appreciate good cheese just as well as the English. We want good butter, too, but not at the cost of the cheese quality. That is not necessary, and a few years ago we did not deem it so, either. Why should there be a tendency in that direction now? We are now better equipped in every de-

partment to send out better cheese than we did in 1868, yet notice the difference in the two reports quoted. We are better equipped, because we have more scientific appliances for handling milk. Our milk is better, because the pastures are improved, and a finer grade of stock feeds upon them. Makers of to-day who rely on the accumulated cheese wisdom handed down through two decades of experience should be rich enough in knowledge to at least not retrograde from the standard of 1868. Let us for one moment lay reform in the tariff, and reform in the civil service on the table and talk, think and act about reform in cheese. Michigan always takes a front seat when reformation of any kind is agitated. We are satisfied she will not take a back seat now. There has probably not been such a tendency in this State as in other localities to rob milk at both ends and on the sides before it is suffered to coagulate in cheese, but let us smother what infection there is before it becomes an established blight on the Wolverine product. We are satisfied that our dairymen are alive to their interests here, and will not drift away from safe anchorage. A shipping cheese requires more body, or, in other words, more acid and firmness than a cheese designed for home consumption. This is partly due to the fact that such a quality is demanded by European consumers and partly because an ocean voyage necessitates it. It takes more milk to make such cheese, and less milk to produce the softer and more perishable home trade goods. In thrusting the cheaper article on the foreign market, New Yorkers have staked a hazardous venture and lost. Nothing is said about the skimmer, but it get in its insidious work all the same—not under full cream brands, probably. We do not insinuate that, but the markets are crowded with night and flat skims, occupying space that should be filled with richer goods. Skims are sent over to England when they really want full cream. Canada and New Zealand step in with a fine

quality of the latter brand, and they take it even in preference to the States' best offering. We hold skimmed cheese greatly responsible for the trade depression under which the American article is now laboring. It is high time that the dry, hard stuff was known no more in all the earth.

PREPARED RENNET AND COLOR.

The value to the cheese trade of scientifically prepared rennet and annotto color cannot be over estimated. Rennet extract, and one quality annottoine, are not in general use, but they should be. With the home prepared infusion of both articles, we have a thousand diverse shades of quality and degrees of strength, and, worst of all, they are often applied to the milk, hit or miss. The result is unevenness in cheese quality and color, where there should be perfect uniformity. We advise all makers to renounce as fast as practicable the old, often unsatisfactory method of soaking rennet skins, and steeping annotto seed, and adopt reliably prepared extracts of these essential cheese ingredients.

CHEESE THAT HUFF.

A GOOD, properly manufactured cheese will never huff up on the surface, or swell the bandage to the point of protuberance. Cheese often huff slightly when curing, and afterward flatten into a smooth, firm surface, but they are never No. 1 stock. The writer can remember fifteen years back when makers did not understand working gaseous curds as they do now. Sales and shipments were far between then, and cheese accumulated in great numbers in factories. It was no uncommon thing in the years '73 and '74, in passing through a curing room containing 500 or 600 cheese, to find a large percentage of the umber covered with immense

blisters, that held in retention offensive smelling gases. Every day the maker would lance these unhealthy swellings with a wire or goose quill, only to have them shortly after bulge out in another place. Besides these partially affected cheese, there were often days' makes of those that would huff all over, swell out like huge puff balls till a slight jar would have rolled them from the shelves. These were the product of floating curds with the gas all left in. A decade and a half ago farmers did not take the same care of their milk that they do now. They were not versed in dairy literature to any extent, and did not see the importance of speedily expelling animal heat from milk or of always furnishing their cows with wholesome drinking water. Hence, tainted milk was more often the rule than the exception. With the present bettered quality of milk and the improved skill of makers in handling it, inflative cheese ought to now be foreign to the curing room. Bad taints are at present seldom met with, but slight ones creep in unawares, unless the maker is vigilant, and then it is his business to eradicate the ill-savor. Sour until acid has completely overcome the gas, grind twice, and give the curd a prolonged airing by frequent stirring. Try the prolonged stirring on common curds that are hot—too hot to go immediately to press—and notice how it will enhance the flavor of the cheese.

FACTORY UTENSILS.

As a maker, I have had opportunities of seeing milk in all stages and in all conditions, and I have found it an invariable rule that the milk furnished by farmers who read and studied the dairy question in all of its phases; who were conversant with dairy literature and adopted the most improved methods extant for producing an abundant, pure and rich flow of milk, were enough affected by the ideas absorbed from library and

press to be unconsciously moulded by their influence. On the other hand, farmers who never read; who avoided all progressive methods as "new-fangled notions" and clung to the primitive ways of their ancestors, forgetful that those ancestors adopted nothing new because there was no new thing to adopt, furnished milk sometimes good, often poor, and never profitable to themselves. A man who doesn't have an opinion on the relative value of milch breeds, who does't know how to feed scientifically and who has narrow conceptions of systematic dairying, generally is, in this competitive epoch, an agricultural cipher.

The other day the writer inspected two cheese factories, separated by only a few miles, each being located on admirable sites and accessible to water. Previous to my visit I had been told that the maker in B——'s factory had, during the past season, produced poor, uneven stock, which was a surprise to his friends, as his trade reputation was excellent. On the other hand, I knew that the cheese from W——-s factory, although manufactured by a man of less experience than his rival, had sold at prices above the former's and footed up a lower ratio. As soon as I had seen the interior of each building the sequel was made plain to me, and subsequent investigation proved it. The first named factory was a mere shell, furnished with utensils both primitive and worn out; the second was a tight, plastered structure and equipped with all of the paraphernalia essential to a modern cheese building. The competition was like running a pony express against a United States mail train.

A cheese factory needs good, improved utensils, just the same as a farm requires machinery of the latest patterns. It should have a boiler, because steam heating is cheaper, more under control and, consequently, safer for scalding than where fire under heating is employed. It should be furnished with a curd mill, because with one the maker has the acid almost

completely under control. Without a mill, the whey must be retained until nearly enough acid has developed to meet the requisite gauge. Then it must be hastily drawn and hastily salted, with the whey not all out of it; too often the acid is in advance of the maker's expectations. Cheese made in this way from day to day cannot help but be uneven in flavor, in salt and in acid. "Salting in the whey," as it is called, without a mill is wasteful, too. As the whey flows off, the constant tendency of the curd is to pack, and hand manipulation to prevent this will start white whey, the life blood of the cheese, in wasteful quantities. With a mill to use, all this is changed. They whey can be drawn when but very little acid has appeared, and the curd, packed and drained, waits for the sourness to develop there. It matures more slowly than when submerged in whey, and when the right point is reached the iron teeth of the mill attack it and tear it up and salt it when in a *dry state*, which is a great advantage. The make-room should be supplied with a gang press and patent hoops, because one screw will compress a dozen cheese and solidify them more firmly than old fashioned single screws. A good cheese can be spoiled after it is in the hoop by insufficient pressing.

I consider the latest milk handling devices almost as essential in a modern factory or creamery as the practical knowledge of the maker. Not merely for labor saving purposes should manufactories be so supplied, but because the demands of present trade require dairy products of a complexion difficult to attain without. It is a "penny wise and pound foolish" policy to scantily furnish a butter or cheese plant when thereby the loss on one under price sale would have more than covered the deficiency in tools.

TO CHEESE MAKERS.

The main point why Canadian cheese is lately quoted higher than American is that they are ahead of us **on uniformity.** To obtain this a uniform Rennet and a uniform Color are most essential. No matter how careful the maker is, he can never get it as uniform as our

Chr. Hansen's Rennet Extract

—— AND ——

CHEESE COLOR.

Taking into account the poor Rennets in the market, the saving by making your own Extract is very small; and as to Cheese Color, even if you did save 60 cents a gallon it would only cost you **5 cents more to color 1000 pounds of cheese,** a mere nothing if ours is at all more uniform and of a more natural shade, **bright, clean, creamy,** and not dull reddish.

Consider this, and give our Extract and Color a fair trial.

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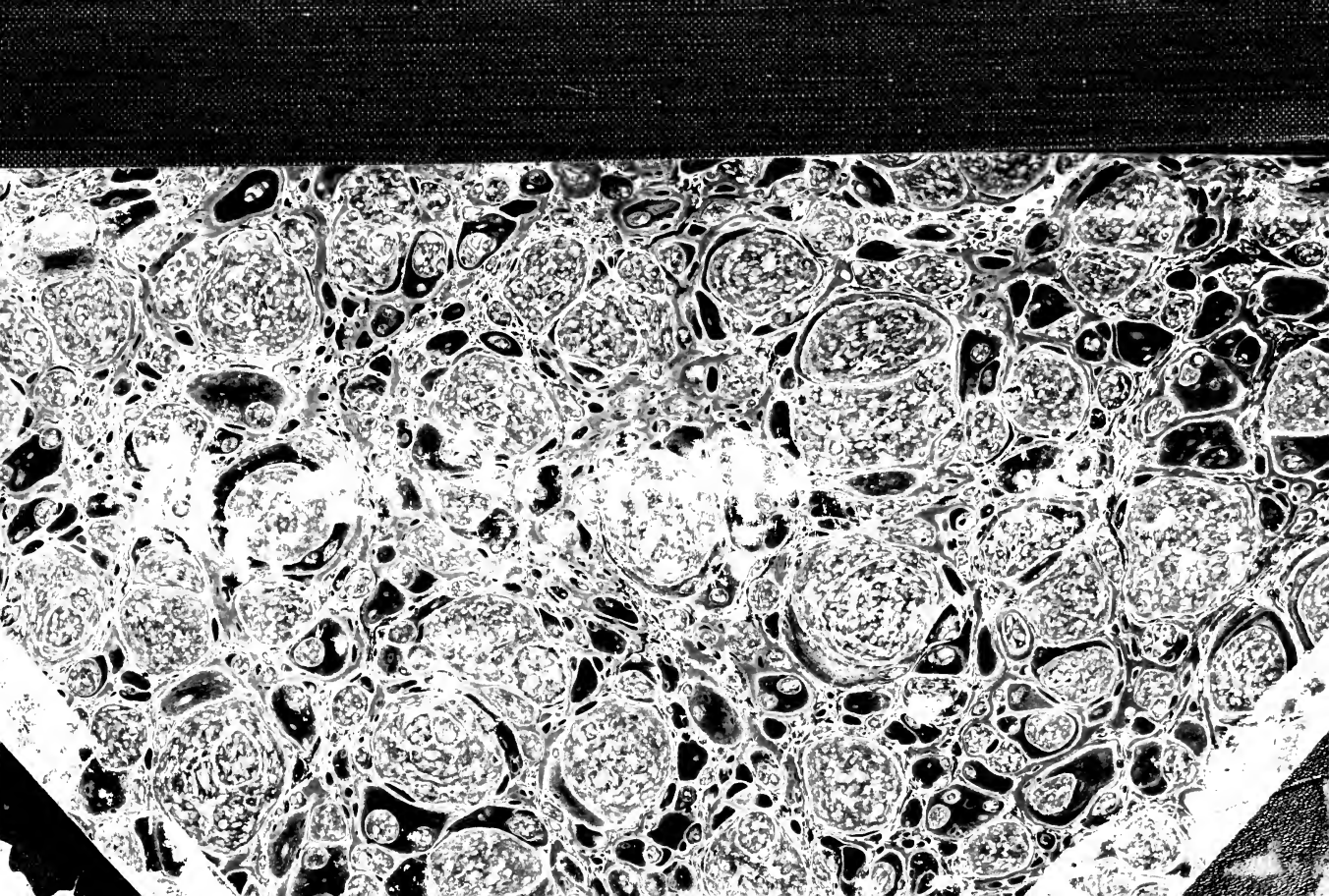
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